

WHAT IS CLAIMED IS

1. An ink jet printing method using an ink jet  
ejecting portion for ejecting ink on a printing  
material and a print quality improving liquid ejecting  
5 portion for ejecting print quality improving liquid to  
be ejected to the printing material, the improvement  
residing in that:

an application mode of the print quality  
improving liquid is different depending on a printing  
10 mode in which printing operation is carried out.

2. A method according to Claim 2, wherein said  
application mode includes one or more of an amount,  
property and manner of application, of print quality  
15 improving liquid.

3. An ink jet printing method using an ink jet  
ejecting portion for ejecting ink on a printing  
material and a print quality improving liquid ejecting  
20 portion for ejecting print quality improving liquid to  
be ejected to the printing material, the improvement  
residing in that:

an amount of the print quality improving  
liquid applied is different depending on a printing  
25 mode in which printing operation is carried out.

4. A method according to Claim 3, wherein the

amount of the print quality improving liquid per unit area of the printing material decreases with increase of number of scans on the same recording area.

5        5. An ink jet printing method using an ink jet  
ejecting portion for ejecting ink on a printing  
material and a print quality improving liquid ejecting  
portion for ejecting print quality improving liquid to  
be ejected to the printing material, the improvement  
10 residing in that:

deferent kinds of print quality improving  
liquids are prepared, and the kind of used the print  
quality improving liquid is different depending on a  
printing mode in which printing operation is carried  
15 out.

6.       A method according to Claim 5, wherein a kind  
of print quality improving liquid having a smaller  
surface tension is used for an area where number of  
20 scans is large.

7.       An ink jet printing method using an ink jet  
ejecting portion for ejecting ink on a printing  
material and a print quality improving liquid ejecting  
25 portion for ejecting print quality improving liquid to  
be ejected to the printing material, the improvement  
residing in that:

2007/06/24 10:52

an amount of the print quality improving liquid applied is different depending on whether a printing mode is for color printing or monochromatic printing.

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8. A method according to Claim 7, wherein an amount of print quality improving liquid per unit area is larger for the monochromatic mode.

10 9. An ink jet printing method using an ink jet ejecting portion for ejecting ink on a printing material and a print quality improving liquid ejecting portion for ejecting print quality improving liquid to be ejected to the printing material, the improvement  
15 residing in that:

an amount of the print quality improving liquid applied is different depending on whether a printing datum is for black color or not.

20 10. A method according to Claim 9, wherein the amount of print quality improving liquid per unit area is larger for the black color.

11. An ink jet printing method using an ink jet  
25 ejecting portion for ejecting ink on a printing material and a print quality improving liquid ejecting portion for ejecting print quality improving liquid to

be ejected to the printing material, the improvement residing in that:

deferent kinds of print quality improving liquids are prepared, and the kind of used the print  
5 quality improving liquid is different depending on whether a printing mode is for color printing or monochromatic printing.

12. A method according to Claim 11, wherein  
10 wherein a kind of print quality improving liquid having a smaller surface tension surface tension is used for the black color.

13. An ink jet printing method using an ink jet  
15 ejecting portion for ejecting ink on a printing material and a print quality improving liquid ejecting portion for ejecting print quality improving liquid to be ejected to the printing material, the improvement residing in that:

20 a scanning operation for the print quality improving liquid and a scanning operation for at least one of black, yellow, magenta and cyan colors, are made different from each other.

25 14. An ink jet printing method using an ink jet ejecting portion for ejecting ink on a printing material and a print quality improving liquid ejecting

portion for ejecting print quality improving liquid to be ejected to the printing material, the improvement residing in that:

a recording head for the print quality

5 improving liquid is disposed between, in a direction of main scan, a recording head for black color and a recording head for yellow, magenta and cyan colors;

a scanning operation of the recording head for the black color and a scanning operation of the 10 recording head for the yellow, magenta and cyan colors are made different from each other; and

different kinds of print quality improving liquid are used for the black color and for the yellow, magenta and cyan colors, respectively.

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15. An apparatus for a method as defined in Claim 1, wherein said method uses thermal energy for ejecting the ink and the print quality improving liquid.

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16. An apparatus according to Claim 15, wherein scanning operation is reciprocal.

25 17. An apparatus according to Claim 16, wherein said print quality improving liquid ejecting portion and said ink ejecting portions are arranged in a direction of reciprocal movement.

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18. An apparatus according to Claim 17, wherein  
a recording head is used which has an array of  
ejection outlets in a direction substantially  
perpendicular to the direction of the reciprocal  
5 movement.

19. A print produced by the method as defined in  
Claim 1.

10 20. A print produced by the apparatus as defined  
in Claim 15.

21. An ink jet apparatus comprising:  
an ink ejecting portion for ejecting ink to a  
15 printing material;  
a print quality improving liquid ejecting  
portion for ejecting print quality improving liquid to  
a printing material;  
means for selecting a printing mode out of a  
20 plurality of printing modes having different  
application modes of the kojoekij; and  
driving means for driving said ink ejecting  
portion and print quality improving liquid ejecting  
portion in accordance with the mode selected by said  
25 selecting means.

22. An apparatus according to Claim 21, wherein

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said ink ejecting portion includes thermal energy generating members for generating thermal energy for ejecting the ink.

5        23. An ink jet apparatus comprising:

a first ejecting portion for ejecting ink to a printing material;

a second ejecting portion for ejecting print quality improving liquid to a printing material; and

10        control means for selectively driving said second ejecting portion.

24. An apparatus according to Claim 23, wherein said control means is manually operable.

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25. An apparatus according to Claim 23, wherein said control means is responsive of a kind of the printing material.

20        26. An apparatus according to Claim 23, wherein the print quality improving liquid has a smaller surface tension than the ink.

25        27. An apparatus according to Claim 23, wherein the print quality improving liquid comprises a cation material of low molecular component and high molecular component, and the ink comprises anion dye.

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28. An apparatus according to Claim 23, wherein the print quality improving liquid comprises a cation material of low molecular component and high molecular component, and the ink comprises anion pigment.

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29. An apparatus according to Claim 23, wherein said first ejecting portion and second ejecting portion have thermal energy generating means.

10       30. An ink jet printing apparatus using an ink jet ejecting portion for ejecting ink on a printing material and a print quality improving liquid ejecting portion for ejecting print quality improving liquid to be ejected to the printing material, the improvement comprising:

control means for controlling an amount of ejected print quality improving liquid in accordance with an ambient condition, when the ink and the kojoekij are mixed or reacted on the printing material.

20       31. An apparatus according to Claim 30, wherein the ambient condition includes a temperature, and higher seeping property ink is used when the temperature is high.

25       32. An apparatus according to Claim 30, wherein

the ambient condition includes a temperature, and the amount decreases with increase of the temperature.

33. An apparatus according to Claim 31, wherein  
5 the higher seeping property ink has higher content of surfactant.

34. An ink jet printing apparatus using an ink jet ejecting portion for ejecting ink on a printing  
10 material and a print quality improving liquid ejecting portion for ejecting print quality improving liquid to be ejected to the printing material, the improvement comprising:

control means for changing a kind of print  
15 quality improving liquid in accordance with an ambient condition, when the ink and the kojoekjij are mixed or reacted on the printing material,

35. An apparatus according to Claim 34, wherein  
20 the ambient condition includes an ambient humidity, and the amount decreases with decrease of the humidity.

36. An apparatus according to Claim 34, wherein  
25 the ambient condition includes an ambient humidity, and higher seeping property ink is used when the humidity is low.

37. An apparatus according to Claim 34, wherein said control means uses different kinds of print quality improving liquid in accordance with the ambient condition.

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38. An ink jet printing apparatus using an ink jet ejecting portion for ejecting ink on a printing material and a print quality improving liquid ejecting portion for ejecting print quality improving liquid to 10 be ejected to the printing material, the improvement comprising:

control means for changing a kind of print quality improving liquid and for controlling an amount of print quality improving liquid in accordance with 15 an ambient condition, when the ink and the kojoekij are mixed or reacted on the printing material.

39. An apparatus according to Claim 38, wherein the ambient condition includes an ambient temperature, 20 and the amount decreases with increase of the temperature.

40. An apparatus according to Claim 38, wherein the ambient condition includes an ambient humidity, 25 and the amount decreases with decrease of the humidity.

41. An apparatus according to Claim 38, wherein the ambient condition includes a temperature, and higher seeping property ink is used when the temperature is high.

5

42. An apparatus according to Claim 38, wherein the ambient condition includes an ambient humidity, and higher seeping property ink is used when the humidity is low.

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43. An apparatus according to Claim 38, wherein said control means uses different kinds of print quality improving liquid in accordance with the ambient condition.

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44. An apparatus according to Claim 42, wherein said control means uses different kinds of print quality improving liquid in accordance with the ambient condition.

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45. An ink jet printing apparatus using an ink jet ejecting portion for ejecting ink on a printing material and a print quality improving liquid ejecting portion for ejecting print quality improving liquid to be ejected to the printing material, the improvement comprising:

control means for controlling an amount of

2007/5242052 - 4 - 2007/5242052

print quality improving liquid in accordance with a kind of the printing material, when the ink and the kojoekekij are mixed or reacted on the printing material.

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46. An apparatus according to Claim 45, wherein said control means increases an amount of the print quality improving liquid per unit area with decrease of seeping property of the printing material.

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47. An apparatus according to Claim 45, wherein said control means uses higher seeping property print quality improving liquid when the seeping property of the printing material is low.

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48. An apparatus according to Claim 45, wherein said control means uses different kinds of print quality improving liquid in accordance with the kind of the printing material.

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49. An ink jet printing apparatus using an ink jet ejecting portion for ejecting ink on a printing material and a print quality improving liquid ejecting portion for ejecting print quality improving liquid to be ejected to the printing material, the improvement comprising:

control means for changing a kind of print

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quality improving liquid in accordance with a kind of the printing material, when the ink and the kojoeikij are mixed or reacted on the printing material.

5        50. An apparatus according to Claim 49, wherein said control means uses higher seeping property print quality improving liquid when the seeping property of the printing material is low.

10        51. An apparatus according to Claim 49, wherein said control means uses different kinds of print quality improving liquid in accordance with the kind of the printing material.

15        52. An ink jet printing apparatus using an ink jet ejecting portion for ejecting ink on a printing material and a print quality improving liquid ejecting portion for ejecting print quality improving liquid to be ejected to the printing material, the improvement comprising:

control means for changing a kind of print quality improving liquid and for controlling an amount of the print quality improving liquid, in accordance with a kind of the printing material, when the ink and  
25 the kojoeikij are mixed or reacted on the printing material.

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53. An apparatus according to Claim 52, wherein  
said control means increases an amount of the print  
quality improving liquid per unit area with decrease  
of seeping property of the printing material.

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54. An apparatus according to Claim 52, wherein  
said control means uses higher seeping property print  
quality improving liquid when the seeping property of  
the printing material is low.

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55. An apparatus according to Claim 52, wherein  
said control means uses different kinds of print  
quality improving liquid in accordance with the kind  
of the printing material.

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56. An ink jet printing apparatus using an ink  
jet ejecting portion for ejecting ink on a printing  
material and a print quality improving liquid ejecting  
portion for ejecting print quality improving liquid to  
be ejected to the printing material, the improvement  
comprising:

control means for ejecting the print quality  
improving liquid to such an area on the printing  
material as is determined corresponding to ejection of  
25 the ink of a predetermined color out of a plurality of  
color inks.

57. An apparatus according to Claim 56, wherein the predetermined color is selectable.

5 the predetermined color is black.

59. An ink jet printing apparatus using an ink jet ejecting portion for ejecting ink on a printing material and a print quality improving liquid ejecting portion for ejecting print quality improving liquid to be ejected to the printing material, the improvement comprising:

control means for ejecting the print quality  
improving liquid to such an area on the printing  
15 material as is determined corresponding to a selected  
datum for ejection of the ink.

60. An apparatus according to Claim 59, wherein the selected datum is the one for a character.

20

61. An apparatus according to Claim 59, wherein the selected datum can be changed.

62. An ink jet printing apparatus using an ink  
jet ejecting portion for ejecting ink on a printing  
material and a print quality improving liquid ejecting  
portion for ejecting print quality improving liquid to

be ejected to the printing material, the improvement comprising:

control means for ejecting the print quality improving liquid to such an area on the printing

5 material as is determined corresponding to a selected datum for ejection of the ink and corresponding to ejection of the ink of a predetermined color out of a plurality of inks.

10 63. An apparatus according to Claim 62, wherein the predetermined color is black, and the selected datum is the one for character.

15 64. An apparatus according to Claim 62, wherein the predetermined color is a one selected from yellow, magenta and cyan, and the ink of other than the predetermined color is a back ink having durability against the ink.

20 65. An apparatus according to Claim 62, wherein the predetermined color is selectable.

66. An apparatus according to Claim 62, wherein the selected datum is changeable.

25 67. An apparatus according to Claim 30, wherein said print quality improving liquid ejecting portion

2025 RELEASE UNDER E.O. 14176

has an electromechanical transducer for ejecting the ink and the print quality improving liquid.

68. An apparatus according to Claim 30, wherein  
5 said print quality improving liquid ejecting portion  
has an electrothermal transducer for ejecting the ink  
and the print quality improving liquid.

69. An apparatus according to Claim 30, wherein  
10 said print quality improving liquid ejecting portion  
has a combination of a electrothermal transducer and  
an electromechanical transducer for ejecting the ink  
and the print quality improving liquid.

15 70. An apparatus according to Claim 30, wherein  
said print quality improving liquid comprises a low  
molecular cation material and a high molecular cation  
material, and said ink comprises anion dye.

20 71. An apparatus according to Claim 30, wherein  
said print quality improving liquid comprises a low  
molecular cation material and a high molecular cation  
material, and the ink comprises anion compound and  
pigment.

25

72. An apparatus according to Claim 30, wherein  
said print quality improving liquid ejecting portion

has a thermal energy converter to eject the liquid, and said ink ejecting portion has a thermal energy converter to eject the ink.

5        73. An apparatus according to Claim 73, wherein  
said ejecting portions are reciprocable.

10      74. An apparatus according to Claim 73, wherein  
said print quality improving liquid ejecting portion  
and said ink ejecting portions are arranged in a  
direction of the reciprocation.

15      75. An apparatus according to Claim 74, wherein  
said said ejecting portions have an array of ejection  
outlets in a direction substantially perpendicular to  
the direction of the reciprocation, respectively.

20      76. A print produced using said apparatus as  
defined in Claim 30.

25      77. An ink jet recording method for recording on  
a printing material using a plurality of color inks  
and a print quality improving liquid for coagulating  
or causing insoluble coloring material of the inks,  
the improvement residing in that:

printing operation is capable in at least two  
of a first mode wherein the print quality improving

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liquid is ejected for an entire printing area of the printing material, a second mode wherein the print quality improving liquid is ejected mainly on a boundary between different inks on the printing  
5 material, and a third mode wherein the print quality improving liquid is not ejected; and  
said mode is selectable during printing.

78. A method according to Claim 77, wherein said  
10 boundary is between a black color ink and a non-black  
color ink.

79. An ink jet recording method for recording on a printing material using chromatic ink containing  
15 coloring material and substantially hypochromic or byaline print quality improving liquid containing a component effective to coagulate or causing insoluble a component of the ink by mixing or reacting with the ink, the improvement residing in that:

20 at least a black ink ejecting portion for ejecting black ink, a print quality improving liquid ejecting portion for ejecting liquid containing at least the print quality improving liquid, are used;  
during one scan, an ejecting portion at a ]  
25 position prior to the black ink ejecting portion is used to eject the print quality improving liquid.

80. An ink jet recording method for recording on a printing material using a plurality of color inks and a print quality improving liquid for coagulating or causing insoluble coloring materials of the inks,  
5 the improvement residing in that:

printing operation is capable in at least two of a first mode wherein the print quality improving liquid is ejected for an entire printing area of the printing material, a second mode wherein the print  
10 quality improving liquid is ejected mainly on a boundary between different inks on the printing material, and a third mode wherein the print quality improving liquid is not ejected; and

in the first and second modes, an amount of  
15 ink ejection per unit area for an area of the printing material where the print quality improving liquid and the ink are superimposed, is larger than an amount of ink ejection per unit area for an area of the printing material where they are not superimposed.

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81. A method according to Claim 80, wherein said boundary is between a black color ink and a non-black color ink.

25 82. An ink jet recording method for recording on a printing material using chromatic ink containing coloring material and substantially hypochromic or

2025 RELEASE UNDER E.O. 14176

byaline print quality improving liquid containing a component effective to coagulate or causing insoluble a component of the ink by mixing or reacting with the ink, the improvement residing in that:

- 5 at least a black ink ejecting portion for  
ejecting black ink, a print quality improving liquid  
ejecting portion for ejecting liquid containing at  
least the print quality improving liquid, chromatic  
ink ejecting portion for ejecting yellow, magenta  
10 and/or cyan inks, are used;

the print quality improving liquid ejecting  
portion is disposed at an end in a main scan  
direction;

in a printing mode wherein the print quality  
improving liquid is mainly ejected for a boundary  
15 between the black ink and a non-black ink, first  
color, second color, third color and fourth color inks  
are sequentially ejected;

for ejection of the print quality improving  
20 liquid, an ejecting portion disposed prior to the  
ejecting portion for printing the second color ink.

83. A method according to Claim 82, wherein the  
first color ink is a yellow, magenta or cyan ink, and  
25 the second color ink is the black ink.

84. A method according to Claim 82, wherein the

first color ink is a black ink, and the second color ink is yellow, magenta or cyan ink.

85. A method according to Claim 77, wherein said  
5 ejecting portion has an electrothermal transducer.

86. A method according to Claim 77, wherein said  
ejecting portion has an electromechanical transducer.

10 87. A method according to Claim 77, wherein said  
print quality improving liquid contains high molecular  
and low molecular cation materials, and the ink  
contains anion dye.

15 88. A method according to Claim 77, wherein said  
print quality improving liquid contains high molecular  
and low molecular cation materials, and the ink  
contains anion dye, or contains anion material and  
pigment.

20 89. An ink jet recording apparatus for recording  
on a printing material using a plurality of color inks  
and a print quality improving liquid for coagulating  
or causing insoluble coloring material of the inks,  
25 the improvement residing in that:

printing operation is capable in at least two  
of a first mode wherein the print quality improving

2025 RELEASE UNDER E.O. 14176

liquid is ejected for an entire printing area of the printing material, a second mode wherein the print quality improving liquid is ejected mainly on a boundary between different inks on the printing material, and a third mode wherein the print quality improving liquid is not ejected; and

there is provided means for switching the mode during printing.

10        90. An apparatus according to Claim 89, wherein said boundary is between a black color ink and a non-black color ink.

15        91. An ink jet recording apparatus for recording on a printing material using chromatic ink containing coloring material and substantially hypochromic or byaline print quality improving liquid containing a component effective to coagulate or causing insoluble a component of the ink by mixing or reacting with the 20 ink, the improvement residing in that:

at least a black ink ejecting portion for ejecting black ink, a print quality improving liquid ejecting portion for ejecting liquid containing at least the print quality improving liquid, are 25 provided;

during one scan, an ejecting portion at a position prior to the black ink ejecting portion is

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used to eject the print quality improving liquid.

92. An ink jet recording apparatus for recording on a printing material using a plurality of color inks  
5 and a print quality improving liquid for coagulating or causing insoluble coloring materials of the inks, the improvement residing in that:

printing operation is capable in at least two of a first mode wherein the print quality improving  
10 liquid is ejected for an entire printing area of the printing material, a second mode wherein the print quality improving liquid is ejected mainly on a boundary between different inks on the printing material, and a third mode wherein the print quality  
15 improving liquid is not ejected; and

control means for operating such that in the first and second modes, an amount of ink ejection per unit area for an area of the printing material where the print quality improving liquid and the ink are  
20 superimposed, is larger than an amount of ink ejection per unit area for an area of the printing material where they are not superimposed.

93. An apparatus according to Claim 92 , wherein  
25 said boundary is between a black color ink and a non-black color ink.

94. An ink jet recording method for recording on a printing material using chromatic ink containing coloring material and substantially hypochromic or byaline print quality improving liquid containing a component effective to coagulate or causing insoluble a component of the ink by mixing or reacting with the ink, the improvement residing in that:

at least a black ink ejecting portion for ejecting black ink, a print quality improving liquid 10 ejecting portion for ejecting liquid containing at least the print quality improving liquid, chromatic ink ejecting portion for ejecting yellow, magenta and/or cyan inks, are used;

the print quality improving liquid ejecting 15 portion is disposed at an end in a main scan direction;

in a printing mode wherein the print quality improving liquid is mainly ejected for a boundary between the black ink and a non-black ink, first 20 color, second color, third color and fourth color inks are sequentially ejected;

for ejection of the print quality improving liquid, an ejecting portion disposed prior to the ejecting portion for printing the second color ink.

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95. An apparatus according to Claim 94, wherein the first color ink is a yellow, magenta or cyan ink.

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and the second color ink is the black ink.

96. An apparatus according to Claim 94, wherein  
the first color ink is a black ink, an the second  
5 color ink is yellow, magenta or cyan ink.

97. An apparatus according to Claim 89, wherein  
said ejecting portion has an electrothermal  
transducer.

10  
98. An apparatus according to Claim 89, wherein  
said ejecting portion has an electromechanical  
transducer.

15  
99. An apparatus according to Claim 89, wherein  
said print quality improving liquid contains high  
molecular and low molecular cation materials, and the  
ink contains anion dye.

20  
100. An apparatus according to Claim 89,  
wherein said print quality improving liquid contains  
high molecular and low molecular cation materials, and  
the ink contains anion dye, or contains anion material  
and pigment.

25  
101. An ink jet apparatus comprising:  
a first ejecting portion for ejecting ink to

a printing material;

a second ejecting portion for ejecting print quality improving liquid to a printing material;

5 setting means for an operational mode of said second ejecting portion in accordance with an image datum; and

driving means for driving said second ejecting portion in accordance with an output of said setting means.

10

102. An ink jet apparatus comprising:

a first ejecting portion for ejecting ink to a printing material;

15 a second ejecting portion for ejecting print quality improving liquid to a printing material;

setting means for an operational mode of said second ejecting portion in accordance with an condition during printing operation; and

driving means for driving said second 20 ejecting portion in accordance with an output of said setting means.

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